

***EPHEMERELLA AOPSIS*, A NEW SPECIES FROM ROCKY MOUNTAIN HIGH (EPHEMEROPTERA: EPHEMERELLIDAE)^{1,2}**

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ABSTRACT: A new species of mayflies, *Ephemerella aopsis* McCafferty, is described from male adults taken at 11,000 feet elevation in Colorado in 1947. The species is evidently closely related to the eastern species *E. needhami* McDunnough, both sharing deeply forked, spineless penes and a small body size. It is an apparent anomaly that larvae of the new species, which are predictably much different than larvae of other *Ephemerella* known from the mountain West, have evidently not been recognized or reported by western stream biologists.

During an intensive study of the Ephemeroptera fauna of Colorado, being conducted by myself and Boris C. Kondratieff and Richard S. Durfee of Colorado State University, a new species of the genus *Ephemerella* was discovered among pinned material housed in the Purdue Entomological Research Collection (PERC). Several factors associated with this new species make it noteworthy. First, this genus (both sensu stricto and sensu lato) is one of only a few groups of mayflies that are presently very well known in North America, especially in the western half of the continent, thanks to the revisionary work of R. K. Allen and G. F. Edmunds, Jr. in the 1960's (esp., Allen and Edmunds 1965). Second, male adults of the new species possess distinctive, deeply forked penes. Only in *E. aurivillii* (Bengtsson) in the West (two more species in the East) are males known to possess this type of genitalia, but this much larger species is different in all details from the new species and could not be confused with it. Third, the specimens of the new species were taken at 11,000 feet elevation at Chasm Lake in Colorado in 1947.

These data, together with the fact that aquatic macrobenthic populations in Colorado have been sampled and studied intensively by many freshwater ecologists and biologists for many years, seem to suggest a couple of possible explanations for this new species being discovered only now. Apparently, it is either very rare and limited with respect to acceptable habitat (it may even be extinct), or its larvae—the life stage of mayflies that has historically been most sampled in Colorado—have been taken but misidentified as another species of Colorado *Ephemerella*. Other species of *Ephemerella* that have been

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found in Colorado are *E. inermis* Eaton and *E. infrequens* McDunnough. Probability for the latter explanation may be diminished somewhat, however, by one further observation. Both *E. inermis* and *infrequens* lack dorsal abdominal tubercles as larvae, whereas larvae of all previously described species of *Ephemerella* having deeply forked penes, such as the new species, possess dorsal abdominal tubercles. Thus, it is unlikely that the two larval types would be confused.

In any case, I describe this material as a new species with the hope that additional specimens, especially reared larva-adult associations, will be sought by stream biologists in the mountain West. Only with such an effort will this anomalous set of circumstances possibly be resolved.

Ephemerella apopsis new species

Description of male adult. Body length 6 mm. Forewing length 7 mm. Body ranging from light to dark brown. Thorax dark brown dorsally, medium brown ventrally. Wings hyaline, venation hyaline. Middle and hind legs light/cream colored (forelegs missing). Abdomen chestnut brown dorsally, considerably lighter laterally, and light brown/tan ventrally with no apparent markings, except pair of faint black, sublateral, longitudinal stripes on terga 9 and 10. Genitalia as in Fig. 1 forceps without subapical expansion on segment 2, otherwise typical of *Ephemerella*; penes lacking any spines, deeply forked, slender apically, with more expanded portion between narrowest apical portion and fused portion, and with fork V-shaped from base. Caudal filaments missing.

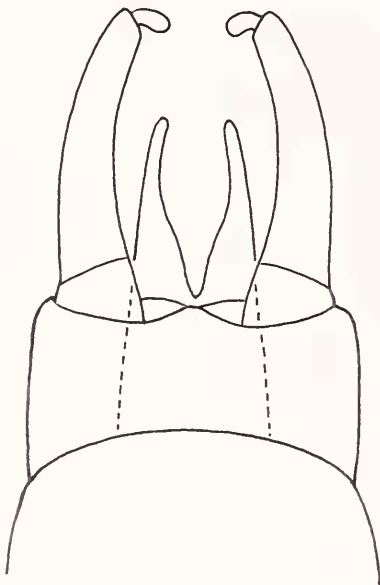


Fig. 1. *Ephemerella apopsis* male adult holotype, genitalia, ventral view.

Material. HOLOTYPE: male adult (pinned), Colorado, Chasm Lake [Boulder Co., Rocky Mountain National Park], VII-24-1947, C. P. Alexander, deposited in PERC, West Lafayette, Indiana. Other material; 4 male adults, same data and deposition as holotype.

Etymology. The trivial epithet is a Greek noun used in apposition and meaning "a lofty spot or eminence that gives a commanding view."

Diagnosis

A couplet (3A) needs to be interjected into Allen and Edmunds' (1965:247) key, "Keys to the North American species of the subgenus *Ephemerella*," as follows regarding male adults of western species:

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|--------|--|-------------------|
| 3(2). | Penes with long apical lobes and a deep median notch | 3A |
| | Penes with short apical lobes and a shallow median notch | 4 |
| 3A(3). | Penis lobes with dorsal and medial spines; forewing more | |
| | than 11 mm long | <i>aurivillii</i> |
| | Penis lobes with no spines; forewing 6-8 mm | <i>apopsis</i> |

DISCUSSION

Larvae of *Ephemerella* are stream dwellers. Although the type locality for this new species is Chasm Lake, the represented adult specimens of *E. apopsis* most probably were associated with larvae that had developed in a local alpine stream (most probably Roaring Fork, which drains Chasm Lake).

There is no doubt that *E. apopsis* and *E. needhami* McDunnough are closely related species, most probably sister species. Because of the short series of *E. apopsis*, it is difficult to know exactly the extent of color differences between the two. Allen and Edmunds (1965) stated that the dorsal abdomen of *E. needhami* was purple (terga 1-7) and brown (terga 8-10). No purple is evident on the pinned specimens before me. Allen and Edmunds (1965) also did not mention any stripes on the posterior terga (which seem to be faintly present on the new species), and I have not seen such in specimens of *E. needhami* from Indiana and Michigan. There also are no markings on the venter of the abdomen of the new species as was described for *E. needhami*. Traver (1935) indicated that the base of the forewings in *E. needhami* were somewhat smoky, but Allen and Edmunds (1965) evidently did not see this variation. The forewings of the new species show no sign of this tinge.

Even if all of the possible color differences cited above were corroborated with additional materials as being consistent, they are not necessarily substantial variations of interspecific significance (based on my experience with color variation in Ephemeroptera populations). Perhaps the most provocative possible difference between the two

species is the shape of the penes. In *E. needhami*, the penes are juxtaposed up to the point of abruptly narrowing [Fig. 17 in Allen and Edmunds (1965)]. In *E. apopsis*, the penes are clearly separated from each other to the base of the fork (Fig. 1). Also in *E. apopsis*, the penes appear to be shorter relative to the length of the forceps [compare Fig. 1 herein with Fig. 17 in Allen and Edmunds (1965)]. The differences I report, however, may be a function of the specimens being fluid preserved vs. pinned. Finally, there appears to be a slight difference in the relative size of the terminal segment of the genital forceps of the two species, being smaller in *E. apopsis* (see Figs. cited above).

Very few transcontinental species of ephemerellids are known, *E. aurivillii* being one example, but it is certainly possible that the new species actually represents a western population or variant of *E. needhami*. However, the larvae of *E. needhami* are among the most distinctive of any ephemerellids, due to the two rows of well-developed, curved tubercles along the dorsum of the abdomen and the dorsal dark stripe down the abdomen [see photographs in McShaffrey and McCafferty (1991)]. Also, *E. needhami* larvae are among the most commonly collected where they occur (this has been my experience in Indiana and Michigan). Their distinctive biology and ecology, particularly with reference to their relationship to the filamentous alga *Cladophora*, was recently treated by McShaffrey and McCafferty (1991).

Considering all this, it is difficult to believe that they have never been taken or recognized in stream studies in Colorado. It, of course, could be argued that it is difficult to believe that any atypical western *Ephemerella* larvae have gone unnoticed during the current era of ecological surveys and research on streams in Colorado and other states and provinces in western North America.

If the species under study happens to be extremely rare or extinct, however, we may never adequately address these particular questions.

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